FOOD AND FEEDING HABITS OF *Protopterus annectens* (OWEN) IN RIVER RIMA, SOKOTO, NIGERIA

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Abstract
The food and feeding adaptations of *Protopterus annectens* (Owen) in River Rima, Sokoto, Nigeria, were studied. Fish samples were collected from August to October, 2007. The Stomach contents were analysed using frequency of occurence method. The fish is an omniviore, feeding mainly on other fish, crustaceans, molluscus, leaf parts, seeds,pytoplankpton and detritus. The junviles showed more .ndigation towards leaf parts and detritus while the adulsts exhibited more diverse and complex feeding. The fish gut length was 1.1 times the body length.

Keywords; *Protopterus annectens* Stomach contents; Gut length

Introduction

The fish family Lepidosirenidae, survivosrs from a very ancient group remotely related to modern fishes is represented by only once species in West Africa, that is *Protopterus annectens* (Owen), commony known as the African lungfish. As their name suggest, Protopterus annectens posses a pair of true lungs wihc are used for breathing seemingly in preference to their gills, as when they are kept in a well oxygnated aquarium, they will nevetherless surface occasionally to take a gulp of air (Reed et al 1967). Although this species is not of significant commercial status, they are of great interest to conservationsist due to to their primtivness (Kees et al 2002) good candiates for the aquarium industry (Reed et al, 1967) and biological control agents of the vector snails of schiistosomes (Daffala et al., 1985). Holden and Reed (1972) reported some natural food substances of the species as frogs, fish molluscs and seeds in River Niger. The species grow to a length of about 1 metre, but the most common sizes seen in the markets are from 300-400mm in length (Reed *et al* 1967)

The state of knowledge on tghis species in Nigeria is largely on their gross anatomy and some behavioural characteristics. The available scientific investigations on their biology are still inadequate for their propagation and managment. This paper presents the results of investigations conducted on the food and feding habits of P.anactens in River Rima, Nigeria.

MATERIALS AND METHODS

Fish samples

Samples of P. Annecgens were obtained from River Rima at kwalkwalawa fish landing site along permanent site, Usman Danfodio Univeristy, Sokoto. The samples were purchased weekly from the fishermen from August to October,k 2007 and examined fresh, while those that could not be treated immediately were preserved in a freezer until the next day.

A total of eighty specimens were examined. The total length (TL cm) of each sample was measured to the nearest centimer on a meaung board graduated in centimeters. The TL ranged from 21.40cm to 43.10cm with means 28.21±4.04SD.

The gut of the fish was removed by making a longitudinal incision along the mid ventral line from the mouth to the anus to expose the visceral organs. The gut was removed carefully by detaching it from other internal

organs and fatty tissues. The gut length (GL) was men measured to the nearest cm on a graduated measuring board. The stomach was cut off from the gut and weighted on a electic top loading balance (Sortius) to obtain the stomach weight (SW). The stomachs were scored 0,25, 50, 75 and 100% according to its fullness as descriibed by Olatunde (1978)

Ideification of Stomach Contents

Each stomach was split open and the contents empitied into a Petri dish. The contents were then observed under a binolcular microope. The food materials were identified wih the aid of key provided by Needham and Needham (1962) and Mellanby (1975).

Analysis of stomach contents\The stomach contens were analyzed by frequency of occumence method as described by Hynes (1950) and Leavastu (1965). Each food item was identified and the number os stomacks in which each food item occured was counted and expressed as a percentage of stomach containing food. The method showed the proportion of individuals eating a particulary food item ina species. The occurence of each food item was expressed as a percentage of all the stomach with food. That is P=(b/ax100, where;\a is a total number of fiish examined with food in the stomach; b is a number of fish containing a particular food item; P is percentage of occurrence of each food item.

Statistical Analysis

The relationship between the fish TL and GL was computed using linear regression model GL = a + b TL where:

GL is gut length (cm), TL is fish total length (cm), a is a constnat; b is exponent. The regression and correlation (r) analyses were carried out using SPSS computer software package.

RESULTS

Food Contents

Analysis of the fullness of stomach showed that 70% had food contents while 30% were empty stomachs (Table 1) The percentage of stomach with food was highest in August and lowest in October. These periods fall withing the peak fllod season and ends of rainy season respectively in the study area.

Table 1 Categorization of stomach fullnessed on different percentages

Stomach fullness (%)	Number of samples	Percentage
O (empty)	24	30.0
25	22	37.6
50	15	18.8
75	06	7.5
100	13	16.2
Total	80	100.00

Table 2 contains the frequency of occurence of the food items with respect to size class and whole sample. Annelids accounted for 16.40% of the food items of the samples <30cm and 7.30% in samples <30cm. Analysis of the stomach content of the whole samples showed tha animal materials with largestg percentage of occurence were fish remains (60.7%) This was followed by annelids (31.1%), crustaceans, (28.6%) and insect parts. (14.3%) Plant tissues and rice grains accounted for 12% and 16% respectively and were higher in samples <30cm (5.5%) and lower in bigger samples >30cm at 16% and 9.1% respectively. The percentage of occurence of plant materils in whole samples were leaf parts (17.9%), phytoplankton (16.1%) unidentified items, sand and detritus occured in 25% and 6.3% of tghe stomachs respectively.

Table 2: Frequency of Occurene of Food Items in the WholeSamples and 2 size classes of P.Anaectens

Food items	Whole samples		Size class <30cm		Size class ≥30cm	
Animal material	F	%	F	%	F	%
Annelids			9	16.4	9	36.0
Cruataceen remains	16	28.6	10	18.2	6	24.0
Diptera	4	7.1	1	1.8	3	12.0
Fish remains, eggs scales, bones etc)	34	60.7	17	30.9	16	64.0
Hemiptera	3	5.4	2	3.6	1	4.0
Insect larvae	4	7.1	2	3.6	2	8.0
Insect parts	8	14.3	4	7.3	4	16.0
Mollusk remains (shells)	12	21.4	7	12.7	4	16.0
Nematodes	3	5.6	1	1.8	2	8.0
Protozoa	4	7.1	1	1.8	3	12.0
Plant material						
Desmids	5	8.9	2	3.6	3	12.0
Diatoms	7	12.5	4	7.3	3	12.0
Leaf parts	10	17.9	7	12.7	3	12.0
Pytoplankton	9	15.1	5	9.1	4	16.0
Plant tissues	6	10.7	3	5.5	3	12.0
Rice Grains	6	10.7	1	1.8	4	16.0
Sorghum Grains	8	14.3	5	9.1	3	12.0
Others						
Unidentified objects	14	25.0	9	16.4	5	20.0
Sand, bottom	36	64.3	25	45.5	9	36.0

Table 3: Monthly analysis of the stomach P anactens

Month	No of stomach examined	No of stomach with food items	%	No of empty stomach	%
Augustus	25	21	84	4	1.6
September	34	22	64.7	12	35.3
October	21	13	61.9	8	38
Total	80	56	70	24	30

Gut length

The gut lenth ranged from 17.40cm in an individual that measured 26.1cm total length to 46.50cm in anothe that measued 43.1cm total lenght the mean gut length was 30.10+4.44SD. Mean TL = 28.21+4.04SD. The fish toal length to gut length ratio was 1.1.1 The gut length appeared to be of medium size.

The correlation coefficient for the relationship between the total length and gut lenth was GL=3.16+0.57 TL (r=0.68;se(b) = 0.04 and p (,0.01)

Discussion

The variety of food substances found inthe stomach of P annectens shows that the speies is an omnivore feeding on animal mateials such as fish ramains, crustacens, insect parts, annelids and plant food substances such as leaf parts, phytoplankton, diatoms and plant tissues. Items such as sorghum garins and rice grains were also found. These may have been washed into the river from nearby farms close to the water body. This agrees with the reports of early investigation on the species from other places that Protopterus are primary omnivorous (Jonnels and Svensson (1954). Thompson, (1969), Dalfala et al (1985) and Otuagbai et al (2001)

While Kees et al (2002) reported that P aethiopicus in Lake Victoria showed selective preferene for molluscan diets, the present study show that P annectens in River Rima had preference for feeding on other fishes. This many probably be due to the availability of smaler fishes in large number to be prayed upon more easity and the molluses

Smaller samples of 30cm showed more indigation towards leaf parts than larger samles, while samples >30cm exhibited a more versatile feeding nature. This indicate that the food preferene of P annectens change with age as found in Clarias gariepinus (Ayanla dn Faturoti, 1990) *Brienmyrus longianalis* (Ikomi, 1996) and Synodontis clais (Shinkafi and Ipinjoly 2001) the presence of more full stomachs and wider variety of food substaces during the flood season may probably be due to explosive growth of plants, insects and fishes (Lowe-Mcconnell, 1975) Smith (1980) reported that many fish eat variety of food that are sometimes ingested with pother indigestible materials such as mud which often influences gut length. Perhaps the presence of canine and bony ridge teeth for breaking and learning of hard seeds, fruits and bones (Reed et al 1967) straightr primitive stokach large liver, medium gut length and the variety of food items to the stomach are further confirmations of omnivorous feedind.

Conclusion

P. annectens is an omnivore, feeding on diverse plant and animal food substances. However, smaller samples of <30cm showed more indigination towards leaf parts, sand bottom deposits and detritus while the adults exhibited a more versatile and complex feeding habit. The fish explored food items of aquatic and terrestrial origin as shown b presence of sorghum seeds and rice grains. This may be due to availability as influenced by season and waer hydrology. It has a medium gut length that was 1.1 times the body length.

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